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ABSTRACT

This study examined the effect of reading ability and frequency of object association on picture-verification latency in a group of 40 fifth graders. Subjects received sets of two slides each, the first of which was a sentence in which the subject and object were in either frequent or infrequent association. When the children had read and had understood the slide, they pressed a button which stopped a clock. The second slide, a picture of the objects described either in the relation suggested by the sentence or in a different relation, was then presented. Subjects responded with "same" or "different," according to the match between sentence and picture. In addition, sentences used to provide the informational context were stated in propositional form ("The horse 'can' jump the fence") or indicative form ("The horse 'is' jumping the fence"). According to an assessment of the time it took subjects to respond to the pictures, reading ability and degree of subject/object relationship, as well as interaction of verb form and response type, were significant. Results indicate that pictures consistent with relational presuppositions can be more quickly verified than those in which relational presuppositions cannot be made. (Author/KS)

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The Search for Information in Pictures

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Abstract

The effect of reading ability and frequency of object association on picture verification latency was examined. In addition, the sentences used to provide informational context were stated in propositional (e.g., the horse can jump the fence) or indicative (e.g., the horse is jumping the fence) forms. Subjects received sets of 2 slides, the first of which was a sentence in which the subject and object were in a frequent or infrequent relationship. When the child read and understood this slide, he was to press a button which stopped a clock. The experimenter then presented the second slide which was a picture of the objects in the same relationship as the previous sentence or noninteractive. Subjects were to respond "same" if the picture expressed the same relationship as the sentence, and "different" if the sentence and picture did not match. The major interest was the time it took subjects to respond to the pictures. Reading ability and degree of subject-object relationship as well as interaction of verb form and response type were significant. Results indicate that pictures which are consistent with the child's relational presupposition can be more quickly verified than those in which relational presupposition are absent.

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One skill children learn is how to employ attentional processes as they search for information in pictures. Research which has demonstrated that increased efficiency of eye movements occurs with increasing age documents the improvement in obtaining information from pictures. Vurpillot (1968) for example, gave children a picture-comparison task. He found that in children under six, picture scanning was limited and judgements about picture content were made on the basis of insufficient information. Children over the age of six seemed to adopt a search strategy that was efficient for the task. Eye movements not only become more efficient but have been shown to vary as a function of the information sought, at least with adult subjects. Yarbus (1967) has demonstrated different eye movements in searching a picture to try to determine what action has taken place vs. trying to determine what action is taking place. Search for specific information in pictures then may be controlled by two factors. The developmental studies suggest that the knowledge state of the organism influences how pictures are searched for information. The particular information sought also helps determine how pictures are searched, at least among mature subjects. In other words both developmental or cognitive level and informational content should control what children look for.

Language is often used to control qualitatively visual search: What to look for may be communicated nonverbally as in pointing gaze imitation Verbally we can tell children to look at the ball, the doggie, etc. but there are much more subtle cues used to guide and constrain the attentional processes

of the individual. One is taking into account the knowledge state of the individual, that is, how much they know about the objects being discussed. If I were to say: The horse is jumping over the elephant and were to show you a picture of such an event taking place, it would be difficult to identify the picture because the relationship is not entirely within the usual set of relations allowed between the horse and the elephant and search would not be constrained. On the other hand if I were to say: The horse is jumping over the fence and ask you to identify a picture of the event, it should be a relatively easy task because the depicted relationship is one congruent with what you allow (or can easily imagine) a horse and a fence to do, hence search should be more constrained.

The present research investigates the effects of this kind of linguistic constraint upon the children's search for information in pictures. The degree of constraint was determined by college students ratings of the frequency of association between subject and object. A high degree of constraint occurs when the relationship is mutually compatible with the capabilities of the objects involved. High constraint is assumed to match well with the subjects knowledge system. An example of a highly constrained sentence would be the boy is sitting on the chair. A low degree of constraint upon the search process would occur when the relationship is not immediately obvious or within the typical knowledge system of the subject. For example, the statement "the chair is supporting the ceiling" is inconsistent with the known relationships between chair and ceiling. A chair is known not to be tall enough or sturdy enough to be engaged in this function. The receiver of such information would not be quite sure what limits, special tools or spatial arrangements are involved in making the relationship possible and should spend more time evaluating and seeking relevant information.

A second way in which our language subtly controls information-seeking in pictures is in manipulating the specificity of the information sought. It was thought that the different verb forms would place differential restriction on the decision rules subjects employ in picture verification. Two verb forms were employed; propositional (e.g., the horse can jump the fence) and indicative (e.g., the horse is jumping the fence). It was expected that the criterion subjects used for terminating the search for information, given can verbs, would be less restrictive than the decision rules employed with indicative verbs, hence resulting in more rapid response. Heider (1958) notes that, in using the word can, we are concerned with the abilities or dispositions inherent in an object. In concern for the potential relationships the process of verifying, given either a can or is verb is similar. However, the is verb also requires the establishment of more specific decision rules to include the criterion for the execution of an action. Hence more specific information would be required.

We were also interested in the degree to which reading ability in children reflected the ability to obtain information from pictures. Reading ability may be representative of general cognitive functioning. It has also been reported (Smith, 1967), that good readers are more able to adjust their search for visual linguistic information to the requirements of the task. It was, therefore, thought that poor readers might adopt search strategies that were less sensitive to the constraints imposed by the sentences.

Method

Forty fifth-grade students, grouped by their teachers on the basis of group reading tests as being in the top or bottom third of their class in reading achievement, were subjects. Subjects viewed 80 sets of 2 slides, the first of which was a sentence of either high or low degree of constraint

(a within factor) and stated in either a propositional or indicative verb, form (a between factor). The second slide was a picture in which the objects were in the same relationship as stated in the sentence which required a same response or noninteractive (different). Subjects were told to push a button when they read and understood the sentence. After the sentence was off of the screen, the experimenter asked the subject if he was ready. The experimenter then presented the picture slide. Subjects were to push one button, labeled same, if the picture expressed the same information as the sentence. They were to press the different button if the picture and sentence did not match.

Results

Sentence reading latencies were subject to an analysis of variance. While the verb form (can or is) was not significant, the effects of both reading ability and constraint were significant ($p.<.01$). Good readers processed the sentences faster than poor readers and sentences high in relational constraint were read faster than those low in constraint.

An analysis of variance was done on the picture verification latencies. Again the effects of reading ability and degree of constraint were significant. These effects are shown in Fig. 2 of the handout (first page). In addition the interaction of response type (same vs. different) and verb form which is presented on the handout was significant ($p < .01$), while there was no difference in the different responses in this interaction, the same responses, given the indicative verb (is) took significantly longer than same responses given the verb can. Thus it took significantly longer to verify that the horse is jumping the fence than to say that the picture agreed with the statement the horse can jump the fence. This interaction is shown in Figure 3 on the first page of the handout.

Discussion

The results demonstrate that information can be obtained more efficiently from pictures which are consistent with the child's relational pre-suppositions. More familiar situations evidently provide more effective constraints upon the possible structure of the picture; hence facillitating informational pick up. As suggested by the lack of an interaction between verb form (can vs. is) and constraints on the relationship of the objects depicted comprehension of a picture may be independent of specific relational information required by the task. That is, the procedures used for the establishment of a relationship do not change as a function of the familiarity of the relationship. It is easier to determine the nature of a picture when a high degree of constraint is provided by the subjects' knowledge of relationships.

The interaction of Response Type and Verb Form does suggest that the set created by the sentence does determine the decision rule by which information is evaluated. When propositional (can) verb is used the subject has only a generalized relationship, and can decide more readily on the basis of potentiality. Indicative (is) verbs require much more specific events to occur; this phenomenon may be especially true for static pictures rather than in natural scenes where ongoing events are occurring. That the Response Type and Verb Form did not also interact with the constraints imposed by the frequency of object interaction may indicate that subjects accepted both levels of constraint as true statements for purposes of searching through pictures.

Readers of both levels of ability seem to employ the same procedure in processing pictures. It cannot be said, on the basis of this data, that poor readers are differentially able to utilize the constraint provided by linguistic context. It is more harmonious with the data to suggest that reading ability reflects general cognitive functioning as general cognitive functioning affects

the ability to process visual information.

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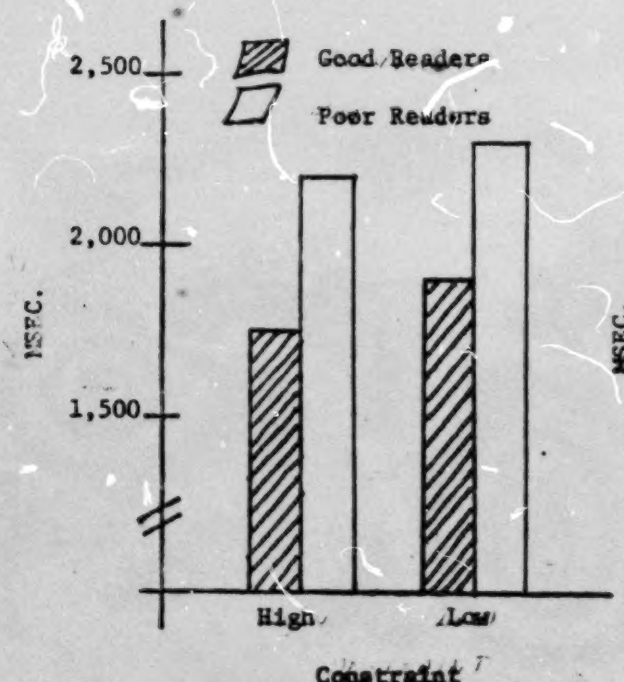

Fig. 1 Constraint and Reading Ability

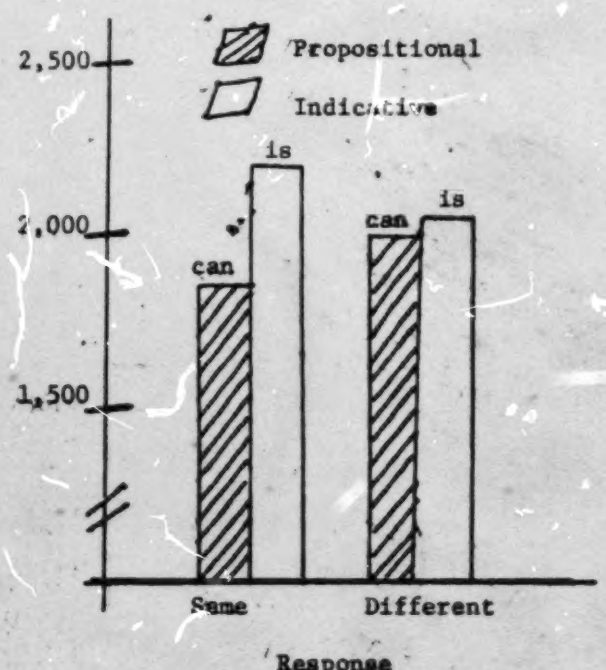

Fig. 2 Same - Different Latencies as a Function of Verb Form